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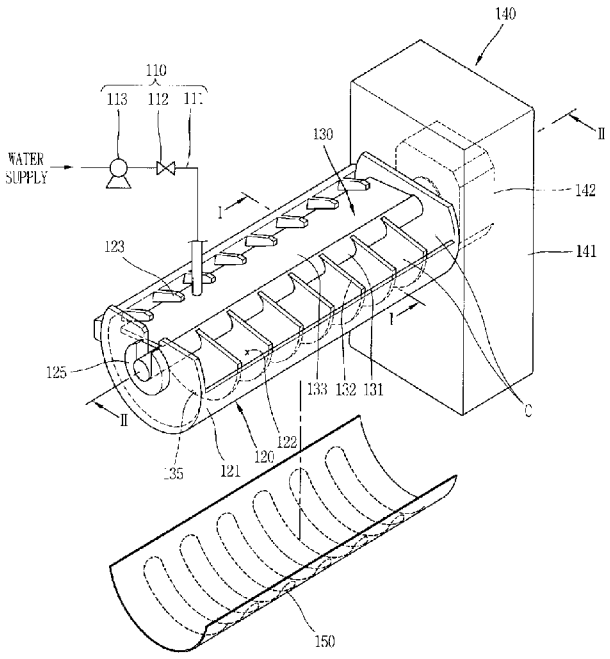
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[Continued on next page]

(54) Title: ICE MAKER, REFRIGERATOR HAVING THE SAME, AND METHOD FOR SUPPLYING ICE THEREOF

[Fig. 2]



(57) Abstract: Disclosed are an ice maker, a refrigerator having the ice maker, and a method for supplying ice of the refrigerator. When the ice making container is rotated, ice of the ice making container freefalls to be released, thus reducing the size of the ice maker and making a refrigerator slimmer. Also, since a partition wall is not provided on an inner circumferential surface of the ice making container, the roughness of the inner circumferential surface of the ice making container can be enhanced, and accordingly, heat can be evenly transferred from an ice releasing heater to reduce a generation amount of residual water. In addition, since ice can be released without using the ice releasing heater, power consumption can be reduced and residual water which can be generated in case of using the heater can be further reduced.

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Description

Title of Invention: ICE MAKER, REFRIGERATOR HAVING THE SAME, AND METHOD FOR SUPPLYING ICE THEREOF

Technical Field

[1] The present invention relates to an ice maker, a refrigerator having the same, and a method for supplying ice of the refrigerator and, more particularly, to an ice maker having a small occupancy area and high space utilization, a refrigerator having the same, and a method for supplying ice of the refrigerator.

Background Art

[2] In general, a household refrigerator is a device having a certain accommodation space to keep food items, or the like, at a low temperature, which is divided into a refrigerating chamber maintained above zero in a low temperature range and a freezing chamber maintained below zero in the low temperature range. Recently, as demand for ice rises, refrigerators having an automatic ice maker making ice are increasing.

[3] The automatic ice maker (referred to as an ice maker , hereinafter) may be installed in the freezing chamber or in the refrigerating chamber according to the types of refrigerators. When the ice maker is installed in the refrigerating chamber, cold air in the freezing chamber is guided (or provided) to the ice maker to make ice.

[4] The ice maker has an ejector installed at an upper side of the ice making container in order to push up and separate ice from the ice making container, while being rotated.

Disclosure of Invention

Technical Problem

[5] However, the related ice makers of refrigerators have the following problems.

[6] First, in the related art ice maker, because the ejector pushes up, while being rotated, to release the ice toward a front side (namely, a main body side of a refrigerator), the ice storage container for keeping ice released from the ice making container in storage is positioned at the front side of the ice making container, and accordingly, the area occupied by the ice maker, namely, the area in a forward/backward direction, is increased, having a limitation in fabricating a thinner refrigerator door.

[7] Second, in the related art ice maker, because a partition wall demarcating an ice making space of the ice making container is integrally formed in the ice making container, there is a limitation in increasing a surface roughness of an inner side of the ice making container in fabricating the ice making container, which results in that the interface between the ice making container and ice is not uniformly heated in heating the ice making container, generating residual water.

[8] Third, in the related art ice maker, in order to release ice from the ice making

container, the ice making container is heated by using a heater. The use of the heater increases power consumption and generates a large amount of residual water.

Solution to Problem

[9] Therefore, an object of the present invention is to provide a refrigerator in which when ice is released from an ice making container, it is directly from the ice making container, thus reducing the area in a forward/backward direction occupied by the ice making container and an ice storage container, and a method for operating the refrigerator.

[10] Another object of the present invention is to provide a refrigerator in which a surface roughness of an ice making container is enhanced to uniformly heat the ice making container and reduce generation of residual water, and a method for operating the refrigerator.

[11] Another object of the present invention is to provide a refrigerator in which ice can be released without heating an ice making container, thus reducing the number of components, reducing power consumption, and reducing residual water, and a method for operating the refrigerator.

[12] To achieve these and other advantages and in accordance with the purpose of the present invention, as embodied and broadly described herein, there is provided an ice maker including: an ice making container having an ice making space to allow water to be put therein to make ice; a partitioning plate having a plurality of partition walls to demarcate the ice making space into a plurality of unit spaces; and a driving unit for supplying a rotary force to the ice making container to allow the ice making container to rotate with respect to the partitioning plate to release ice of the ice making space.

[13] To achieve the above objects, there is also provided a refrigerator including: a refrigerator main body having an ice making chamber; and an ice maker provided in an ice making chamber of the refrigerator main body, wherein the ice maker includes: an ice making container having an ice making space to allow water to be put therein to make ice; a partitioning plate having a plurality of partition walls to demarcate the ice making space into a plurality of unit spaces; and a driving unit for supplying a rotary force to the ice making container to allow the ice making container to rotate with respect to the partitioning plate to release ice of the ice making space.

[14] To achieve the above objects, there is also provided a method for supplying ice, including: making ice in an ice maker; receiving an ice dispense signal from a user; rotating an ice making container of the ice maker; separating ice from the ice maker; and dispensing the separated ice.

[15] In the ice maker, the refrigerator having the same, and the method for supplying ice of the refrigerator according to exemplary embodiments of the present invention,

because ice freefalls to be released as the ice making container is rotated, the size of the ice maker can be reduced and the area occupied by the ice maker can be reduced to make a refrigerator slimmer.

[16] Also, because ice freefalls to be released as the ice making container is rotated, the use of a heater for releasing ice can be omitted, and accordingly, power consumption can re reduced and residual water which may be generated when a heater is used can be reduced.

[17] In addition, because a partitioning plate is separately provided without forming a partition wall on an inner circumferential surface of the ice making container, the roughness of the inner circumferential surface of the ice making container can be enhanced. Accordingly, heat can be uniformly transferred in the ice making container, reducing a generation amount of residual water in the ice releasing operation and preventing stored ice cubes from being entangled.

[18] Moreover, because the ice releasing heater for releasing ice from the ice making container is installed on the partitioning plate, a fixed body, the ice making container can be easily driven, facilitating the fabrication of the ice making container and reducing power consumption.

[19] The foregoing and other objects, features, aspects and advantages of the present invention will become more apparent from the following detailed description of the present invention when taken in conjunction with the accompanying drawings.

Advantageous Effects of Invention

[20] When the ice making container is rotated, ice of the ice making container freefalls to be released, thus reducing the size of the ice maker and making a refrigerator slimmer. Also, since a partition wall is not provided on an inner circumferential surface of the ice making container, the roughness of the inner circumferential surface of the ice making container can be enhanced, and accordingly, heat can be evenly transferred from an ice releasing heater to reduce a generation amount of residual water. In addition, since ice can be released without using the ice releasing heater, power consumption can be reduced and residual water which can be generated in case of using the heater can be further reduced.

Brief Description of Drawings

[21] The accompanying drawings, which are included to provide a further understanding of the invention and are incorporated in and constitute a part of this specification, illustrate embodiments of the invention and together with the description serve to explain the principles of the invention.

[22] In the drawings:

[23] FIG. 1 is a bottom freezer type refrigerator having an ice maker according to an

exemplary embodiment of the present invention;

[24] FIG. 2 is a perspective view of the ice maker in FIG. 2;

[25] FIG. 3 is a sectional view taken along line I-I in FIG. 2;

[26] FIG. 4 is a sectional view taken along line II-II in FIG. 2;

[27] FIG. 5 is a schematic block diagram of a control unit in FIG. 2;

[28] FIG. 6 is a vertical sectional view showing an ice making process of the ice maker in FIG. 2;

[29] FIG. 7 is a flow chart illustrating the ice making process performed by the ice maker in FIG. 2;

[30] FIGS. 8 and 9 are a perspective view and a cross-sectional view showing another example of a cover plate of the ice maker in FIG. 2;

[31] FIG. 10 is a perspective view showing another example of the ice maker of FIG. 1;

[32] FIG. 11 is a sectional view taken along line III-III in FIG. 10;

[33] FIG. 12 is a rear perspective view of the ice maker of FIG. 10;

[34] FIG. 13 is a schematic block diagram of a control unit of FIG. 10;

[35] FIG. 14 is a vertical sectional view showing the process of making ice by the ice maker of FIG. 10; and

[36] FIG. 15 is a flow chart illustrating the process of making ice in the ice maker of FIG. 10.

Best Mode for Carrying out the Invention

[37] An ice maker, a refrigerator having the same, and a method for supplying ice of the refrigerator according to exemplary embodiments of the present invention will be described in detail with reference to the accompanying drawings.

[38] FIG. 1 is a bottom freezer type refrigerator having an ice maker according to an exemplary embodiment of the present invention.

[39] As shown in FIG. 1, a refrigerator according to an exemplary embodiment of the present invention includes a freezing chamber 2 formed at a lower portion of a refrigerator body 1 and keeping food items in storage in a frozen state and a refrigerating chamber 3 formed at an upper portion of the refrigerator body 1 and keeping food items in storage in a refrigerated state. A freezing chamber door 4 and is installed at the freezing chamber 2 to open and close the freezing chamber 2 in a drawer manner, and a plurality of refrigerating chamber doors 5 are installed at both sides of the refrigerating chamber 3 in order to open and close the refrigerating chamber 3 at both sides in a hinged manner. A mechanic chamber is formed at a lower end of a rear side of the refrigerator body 1, in which a compressor and a condenser are installed.

[40] An evaporator (not shown) connected with the condenser and the compressor to supply cooling air to the freezing chamber 2 or to the refrigerating chamber 3 may be

installed on the rear surface of the refrigerator body 1, namely, on the rear wall surface of the freezing chamber 2 between an outer case and an inner case. Also, the evaporator may be insertedly installed at an inner side of a side wall surface or an upper wall surface of the freezing chamber 2 or may be insertedly positioned at an inner side of a barrier demarcating the freezing chamber 2 and the refrigerating chamber 3. A single evaporator may be installed in the freezing chamber 2 to distributedly supply cold air to the freezing chamber 2 and the refrigerating chamber 3, or a freezing chamber evaporator and a refrigerating chamber evaporator may be installed, respectively, to independently supply cold air to the freezing chamber 2 and the refrigerating chamber 3.

[41] An ice making chamber 51 is formed on an inner wall surface of an upper portion of the refrigerating chamber door 5 in order to make and keep ice, and an ice maker 100 for making ice is installed in the interior of the ice maker 51. An ice storage container 52 for keeping ice made in the ice maker 100 in storage is installed at a lower side of the ice making chamber 51, and a dispenser 53 is installed to be exposed from the refrigerator to allow ice stored in the ice storage container 52 to be drawn out of the refrigerator. Here, the ice storage container 52 is configured to allow the ice maker 100 according to an exemplary embodiment of the present invention (to be described) to freefall ice, so the ice storage container 52 may be disposed such that the center of the ice storage container 52 is positioned substantially on a straight line with the center of the ice making container 120.

[42] In the refrigerator according to an exemplary embodiment of the present invention as described above, when a load in the freezing chamber 2 or the refrigerating chamber 3 is detected, the compressor operates to generate cold air from the evaporator, and a portion of the cold air is supplied to the freezing chamber 2 and the refrigerating chamber 3, and another portion of the cold air generated from the evaporator is supplied to the ice making chamber 51. The cold air supplied to the ice making chamber 51 is exchanged to allow the ice maker 100 mounted in the ice making chamber 51 to make ice and then retrieved to the freezing chamber 2 or supplied to the refrigerating chamber 3. The ice made in the ice maker 100 is taken out according to a request from the dispenser 52. This sequential process is repeatedly performed.

[43] FIG. 2 is a perspective view of the ice maker in FIG. 2, FIG. 3 is a sectional view taken along line I-I in FIG. 2, FIG. 4 is a sectional view taken along line II-II in FIG. 2, and FIG. 5 is a schematic block diagram of a control unit in FIG. 2.

[44] As illustrated, the ice maker 100 includes a water supply unit 110 connected to a water source and supplying water, an ice making container 120 having ice making space 122 for receiving water supplied from the water source 110 and making ice, a partitioning plate 130 for partitioning the ice making space 122 of the ice making

container 120 into a plurality of unit spaces (C), an a driving unit 140 installed at one side of the ice making container 120 and rotating the ice making container 120 to allow ice to be released from the ice making container 120.

[45] The water supply unit 110 includes a water supply pipe 111 connecting the water source and the ice making space 122 of the ice making container 120, a water supply valve 112 installed in the middle of the water supply pipe 111 to regulate the amount of water supplied (or a water supply amount), and a water supply pump installed at an upper flow side or a lower flow side of the water supply valve 112 to pump water. Here, the water supply pump 113 is required to supply uniform water pressure, but not requisite. When the water supply pump 113 is excluded, water may be supplied by using a height difference between the water source and the ice making container 120.

[46] The water supply pipe 111 may be directly connected to the water source to supply water, or the water supply pipe 111 may be connected to a water tank (not shown) provided in the refrigerating chamber 3 and storing a certain amount of water therein. In this case, the water tank is a water source. Here, in order to supply an appropriate amount of water to the ice making container 120, a water level sensor may be installed in the ice making container 120 or a flow sensor for detecting the amount of water flow may be installed in the water supply pipe or a water level sensor may be installed in the water tank.

[47] The water supply valve 112 and the water supply pump 113 may be electrically connected to transmit and receive a signal to a control unit 160. The control unit 160 may regulate the water supply amount based on a value detected in real time by the water level sensor or the flow sensor, or an operation time of the water supply valve 112 and the water supply pump 113 may be made into data so as to periodically turn on or off the water supply valve 112 and the water supply pump 113.

[48] The ice making container 120 includes a container unit 121 having the ice making space 122 to receive water and make ice therein, and a shaft unit 125 formed to be protruded from one side of the container unit 121.

[49] The container unit 121 has a single ice making space 122 substantially having a shape of a hemispherical container section. However, a slit (not shown) may be formed in a circumferential direction on an inner circumferential surface of the container unit 121 to allow partition walls 132 of the partitioning plate 30 (to be described) to be inserted therein. The container unit 121 includes pushers 123 formed to be protruded in a tooth form at one opening end thereof in order to push ice in each of the unit spaces (C) to release the ice. The inner circumferential surface of the ice making container 120 constituting the ice making space 122 may be coated with a fluorine material. Of course, the inner circumferential surface of the ice making container 120 may be coated with any other materials such as ceramic, or the like.

[50] The shaft unit 126 may be formed at the center of the container unit 121 in an axial direction and may be coupled to the driving unit 140 with a decelerator interposed therebetween.

[51] The partitioning plate 130 includes a fixed part 131 extending in the same direction as the shaft unit 125 of the ice making container 120, having a shaft-like shape, and fixed to the driving unit 140, a plurality of barrier wall parts 132 formed at certain interval along the axial direction from the fixed part 131 toward the ice making container to partition the ice making space 122 into a plurality of unit spaces (C), and a stopper part 133 connecting upper surfaces of the partition wall parts 132 to allow ice cubes in the unit spaces (C) to be released, rather than being rotated along with the ice making container 120 when the ice making container 120 is rotated.

[52] As mentioned above, one end of the fixed part 131 is integrally coupled to a motor housing 141 constituting the driving unit 140 and the other end of the fixing part 131 is rotatably coupled to the center of the container unit 121 of the ice making container 120.

[53] The partition wall parts 132 are formed to have the same shape, namely, a semi-circular shape, as that of the ice making space 122 when projected in the axial direction. The partition wall parts 132 may be formed such that an outer circumferential surface thereof is in contact with an inner circumferential surface of the ice making space 122, in order to reduce a connection area between ice cubs (or ice pieces) to release the ice.

[54] A water channel 135 having a certain depth is formed at one side of the outer circumferential surface of the partition wall parts 132, specifically, at the lowermost point of the partition wall parts 132, to allow water to move to the unit spaces (C). Of course, the water channel 135 may be penetratingly formed in the middle of the partition wall parts 132.

[55] As shown in FIG. 3, the stopper part 133 may be formed at a portion where a pusher 123 of the ice making container 120 is provided, namely, at a front end portion when the ice making container 120 is rotated. The stopper part 133 may be formed to cover the entire upper surface of one side of the partition wall parts 132, or may be formed to be protruded to prevent ice from being rotated along with the ice making container 120 according to circumstances. However, since the stopper part 133 may serve to prevent water put in the ice making container 120 from being splashed, it may be formed to be as large as possible.

[56] The partitioning plate 130 may be coated with a fluorine group like the inner circumferential surface of the ice making container 120.

[57] The driving unit 140 may include a motor housing 141 fixedly installed in the ice making chamber 51, a driving motor 142 installed in the interior of the motor housing

141 and generating a turning force, and a deceleration gear 143 coupled to the driving motor 142 to decelerate the turning force and deliver the same to the ice making container 120.

[58] The shaft unit 125 of the ice making container 120 is rotatably coupled to the motor housing 141, and the fixed part 131 of the partitioning plate 130 is fixedly coupled to the motor housing 141.

[59] Meanwhile, a heater made of a heat conductive material such as aluminum to separate ice from the ice making space 122 of the ice making container 120 may be installed on an outer circumferential surface of the ice making container 120. The heater 150 may be configured as a line heater in contact with the outer circumferential surface of the ice making container 120.

[60] The heater 150 may be controlled to interwork with the water supply unit 110. For example, it is determined whether water is being currently supplied to the ice making container 120 to make ice, whether ice making is being performed, or whether ice, after being made, is being released according to the change in the values detected by the water level sensor or the flow sensor, and when it is determined that water is being supplied to make ice or when it is determined that water has been completely supplied and ice is being currently made, the operation of the heater is stopped, and when ice releasing is currently performed after ice making is completed, the operation of the heater 150 may be controlled to start.

[61] Here, a point in time at which the heater 150 is operated may be determined by detecting the temperature of the ice making container 120 in real time or periodically, or a time which has lapsed after the value of the water level sensor or the flow sensor of the water supply unit 110 was changed may be made into data and the heater may be forcibly operated according to the data value. Namely, whether or not the ice making operation has been completed can be checked by detecting the temperature of the ice making container 120 or through an ice making time. For example, when the temperature measured by a temperature sensor (not shown) mounted in the ice making container 120 is lower than a certain temperature, e.g., -9 C, it may be determined that ice making has been completed, or when a certain time has lapsed after water was supplied, it may be determined that ice making has been completed.

[62] Although not shown, the heater 150 may be formed of a conductive polymer, a plate heater with positive thermal coefficient, an aluminum thin film, and other materials such as a heat transfer available material, or the like.

[63] Except that the heater is attached to the front side of the ice making container 120, although not shown, it may be buried in the interior of the ice making container 120 or provided on an inner circumferential surface of the ice making container 120. Also, without using the heater 150, the ice making container may be configured as a resistor

which can generate heat such that at least a portion of the ice making container 120 may serve as a heater to generate heat when electricity is applied thereto.

[64] The heater 150 may be installed to be spaced apart from the ice making container 120, rather than being in contact with the ice making container 120, so as to be configured as a heat source. For example, the heat source includes a light source irradiating light to at least one of ice and the ice making container 120, a magnetron irradiating microwaves to at least one of ice and the ice making container 120. The heat sources such as the heater, the light source, or the magnetron directly applies thermal energy to at least one of ice and the ice making container 120 or to the interface therebetween to melt a portion of the interface between ice and the ice making container 120. Accordingly, when the ice making container 120 is rotated, although the interface between the ice and the ice making container 120 is not entirely thawed, the ice can be separated from the ice making container by the self-weight or the pusher 123 of the ice making container 120.

[65] Meanwhile, the heater 150 and the driving motor 142 may be controlled together by a control unit 160, namely, a microcomputer, electrically connected to the driving motor 142 and the heater 150. For example, as shown in FIG. 5, the control unit 160 includes a detection unit 161 connected to a temperature sensor (not shown) to detect the temperature of the ice making container 120 or a timer (not shown) to detect a time which has lapsed since water was supplied, a determining unit 162 for determining whether or not ice making has been completed by comparing the temperature or time detected by the detection unit 151 with a reference value, and a command unit 163 for controlling an ON/OFF operation of the heater 150 and the operation of the driving motor 142 according to the determination of the determining unit 162.

[66] An ice supply method in a refrigerator according to an exemplary embodiment of the present invention is shown in FIGS. 6 and 7.

[67] As illustrated, when ice making is required, the ice maker 100 is turned on to start ice making operation (S1). Then, the water supply unit 110 supplies water to the ice making container 120 (S2). In this case, the water supply amount is detected by using the water level sensor installed at the ice making container 120, the flow sensor installed at the water supply pipe, the water level sensor installed at the water tank, and the like, in real time, and the detected water supply amount is delivered to the microcomputer. Then, the microcomputer compares the received water supply amount with a pre-set water supply amount (S3). The microcomputer determines whether or not an appropriate amount of water has been supplied to the ice making container 120 according to the comparison, and when the microcomputer determines that an appropriate amount of water has been supplied to the ice making container 120, the microcomputer shuts off the water supply valve of the water supply unit 110 to prevent

water from being supplied to the ice making container any more (S4).

[68] When the water supply to the ice making container 120 is completed, the water in the ice making container 120 is exposed to cold air supplied to the ice making chamber 51 for more than a certain period of time and frozen (S5). While the water in the ice making container 120 is being frozen, the temperature sensor (not shown) detects the temperature of the ice making container periodically or in real time and delivers the detected temperature to the microcomputer. The microcomputer compares the received measured temperature with a pre-set temperature (S6). The microcomputer determines whether the surface of the water put in the ice making container 110 has been frozen, and when the microcomputer determines that the surface of the water in the ice making container 110 has been frozen, it stops the sequential operations and enters a water releasing step (S7).

[69] When ice releasing is requested by the user, the heater 150 is operated by the control unit 160, and when the heater 150 is operated, heat is applied to the ice making container 120, melting an outer surface of the ice in contact with the inner circumferential surface of the ice making container 120 (S8 and S9).

[70] Thereafter, when the container unit 121 of the ice making container 120 is rotated centering around the shaft unit 125 according to the operation of the driving motor 142 by the control unit 150, the ice (I) cubes of the unit space C are stopped by the stopper part 133 of the partitioning plate 130, so they cannot be rotated along the ice making container 120 (S10). Then, the ice making container 120 is further rotated, the pusher 123 of the ice making container 120, passing between the partition wall parts 132 formed at the opposite side of the stopper part 133 of the partitioning plate 130, pushes the ice (F) cubes of the respective unit spaces (C) by the turning force (F) according to the driving motor 142. Then, the ice (I) cubes are separated from the separation wall parts 132 and the stopper part 133 of the partitioning plate 130 to freefall to be discharged to the ice storage container 52 or directly to the dispenser 53 (S11 and S12).

[71] Here, in the process of releasing ice from the ice making container 120 or in the process of preparing ice releasing, supply of cold air to the ice making chamber 51 may be stopped to facilitate the ice releasing operation and reduce power applied to the heater 150.

[72] When dispensing is completed, the operations of the heater 150 and the cutting unit 140 are stopped, the water supply valve 112 is open to supply an appropriate amount of water to the ice making container 120 by the water level sensor, the flow sensor, or the like. This sequential process is repeatedly performed.

[73] In this manner, since ice freefalls to be released when the ice making container is rotated, the size of the ice maker can be reduced and the area occupied by the ice maker can be also reduced, and accordingly, the refrigerator including the ice maker

can become slimmer. Namely, in the related art, the ice of the ice making container is pushed by an ejector so as to be released, a space for pushing up the ice from the ice making container is required, and in order to store the ice, the ice storage container must be provided at a front side of the ice making container, the area occupied by the ice maker is large over all, having a limitation of making the refrigerator slimmer. However, in the present exemplary embodiment, the ice making container is rotated to allow ice to freefall to be released, there is no need to push up and rotate ice, reducing the ice releasing space, and since the ice storage container is provided to a lower side of the ice making container, the area occupied by the ice maker can be significantly reduced to make the refrigerator or the refrigerator door slimmer.

[74] Also, because there is no partition wall on the inner circumferential surface of the ice making container, the roughness of the inner circumferential surface of the ice making container can be enhanced, and accordingly, when the ice releasing heater is installed at the ice making container, heat can be evenly transferred by the heat releasing heater, effectively performing the heat releasing operation, and the amount of residual water generation can be reduced to prevent ice kept in storage from being entangled.

[75] In addition, since the ice making container is rotated to push ice to allow ice to freefall so as to be released, the use of an ice releasing heater can be omitted, and in this case, since ice can be released without using a heater, power consumption can be reduced as much and residual water which may be otherwise generated by a heater can be reduced to improve the quality of ice stored in the ice storage container.

[76] Meanwhile, as shown in FIGS. 8 and 9, in case in which the ice maker 100 is installed on the refrigerator door, since water filled in the ice making container 120 may be shaken to be gushed out before being completely frozen when the refrigerator door is open and closed. Thus, in order to prevent water put in the ice making container 120, a cover plate 170 may be additionally provided at an upper side of the partitioning plate 130.

[77] The cover plate 170 may have a shape of a semicircular section concave in the opposite direction to that of the ice making container 120, and a water supply recess and cold air through hole may be formed to be long in a horizontal direction at the center of the upper end of the cover plate 170. The cover plate 170 may include an elastic part 172 to allow the cover plate 170 to elastically open when the ice making container 120 is rotated.

[78] When the foregoing cover plate is provided, although the ice maker is installed on the refrigerator door as mentioned above, water put in the ice making container can be prevented from being shaken to be gushed out, increasing the ice making effect. In this case, the configuration and operation of the ice maker are the same as those described above, so a detailed description thereof will be omitted.

Mode for the Invention

[79] An ice maker according to a different exemplary embodiment of the present invention is as follows. Namely, in the foregoing exemplary embodiment, the ice releasing heater is installed in the ice making container, but in the present exemplary embodiment, an ice releasing heater is installed to be in contact with partition walls.

[80] FIG. 10 is a perspective view showing another example of the ice maker of FIG. 1. FIG. 11 is a sectional view taken along line III-III in FIG. 10. FIG. 12 is a rear perspective view of the ice maker of FIG. 10. FIG. 13 is a schematic block diagram of a control unit of FIG. 10. A detailed description of the same parts in the present exemplary embodiment as those of the ice maker of the foregoing exemplary embodiment will be omitted.

[81] As illustrated, an ice maker 200 includes a water supply unit 210 connected to a water source and supplying water, an ice making container 120 having an ice making space 222 for receiving water supplied from the water source 210 and making ice, partition walls 230 partitioning the ice making space 222 into a plurality of unit spaces (C), a stopper 240 provided to an opening side of the ice making container 220 and releasing ice from the ice making container, and a driving unit 250 installed at one side of the ice making container 220 and rotating the ice making container 220 to release ice.

[82] The water supply unit 210 includes a water supply pipe 211 connecting the water source and the ice making container 220, a water supply valve 212 installed in the middle of the water supply pipe 111 to regulate the amount of water supplied (or a water supply amount), and a water supply pump installed at an upper flow side or a lower flow side of the water supply valve 212 to pump water. Here, the water supply pump 213 is required to supply uniform water pressure, but not requisite. When the water supply pump 213 is excluded, water may be supplied by using a height difference between the water source and the ice making container 220.

[83] The ice making container 220 has substantially a shape of a semicircular section and includes a single ice making space 221. A coated surface 222 made of a fluorine material may be formed on an inner circumferential surface of the ice making space 221. The coated surface may be made of any other materials such as ceramic, or the like.

[84] As shown in FIGS. 11 and 12, blocking film parts 223 made of a material having elasticity such as silicon may be formed at both ends of the opening side of the ice making container 220 in order to prevent water from overflowing at a water supply position of the ice making container 220.

[85] The plurality of partition walls 230 may be disposed at certain intervals along a

lengthwise direction of the ice making container 220 to demarcate the ice making space 221 into a plurality of unit spaces (C). The partition walls 230 are formed to have the same shape, namely, a semi-circular shape, as that of the ice making space 122 when projected in the axial direction. The partition wall parts 132 may be formed such that an outer circumferential surface thereof is in contact with an inner circumferential surface of the ice making space 122, in order to reduce a connection area between ice cubs (or ice pieces) to release the ice.

[86] A water channel 231 having a certain depth is formed at one side of the outer circumferential surface of the partition walls 230, specifically, at the lowermost point of the partition walls 230, to allow water to move to the unit spaces (C). Of course, the water channel 231 may be penetratingly formed in the middle of the partition walls 230.

[87] The stopper 240 may be integrally formed with the partition walls by connecting the upper surfaces of the partition walls 230 in order to release ice cubes of the unit spaces (C) without being rotated along with the ice making container 220 when the ice making container 220 is rotated. A coated surface make of a fluorine material may be formed on the surface of the stopper 240, like the inner circumferential surface of the ice making container 220.

[88] As shown in FIG. 11, the stopper 240 may be formed at a portion first contacted by ice when the ice making container 220 is rotated. The stopper 240 may be formed to cover the entirety of one upper surface of the partition walls 230, or may be formed have protrusions and depressions to prevent ice from being rotated along with the ice making container 220 according to circumstances. However, preferably, the stopper 240 is formed to be as large as possible and has a shape of a flat plate such that an end thereof is in contact with the inner circumferential surface of the ice making container 220 in order to serve to prevent water put in the ice making container 220 from being splashed and form a water storage space 241 between an upper surface of the stopper 240 and the inner circumferential surface of the ice making container 220.

[89] The stopper 240 may be formed to be downwardly sloped toward the inner circumferential surface of the ice making container 220 in order to form the water storage space 241 on its upper surface, and a blocking part 242 may be formed at an end of an inner side of the stopper 240 and have a certain height in a vertical direction in order to prevent water in the water storage space 241 from flowing into the ice making space 221.

[90] The driving unit 250 may include a motor housing 251 fixedly installed in the ice making chamber 51, a driving motor 252 installed in the interior of the motor housing 251 and generating a turning force, and a deceleration gear 253 coupled to the driving motor 252 to decelerate the turning force and deliver the same to the ice making container 220.

[91] Meanwhile, a frame 260 fixedly coupled to the refrigerator door 5 is formed to be in contact with or integrally formed at a portion of the upper surface of the partition walls 230, namely, at the opposite side of the stopper 240, and a heater insertion recess 261 may be formed to be long along a lengthwise direction of the ice making container 220 to allow an ice releasing heater 270 to be mounted therein.

[92] The frame 260 may be made of a material having excellent heat conductivity, such as aluminum, or the like. When the partition walls 230 are coupled to be in contact with the frame 260, the partitions walls 230 may be made of the same material as that of the frame 260, namely, may be made of an aluminum material having excellent heat conductivity.

[93] The configuration and operation of the heater 270 and a control unit 280 (See FIG. 12) for operating the heater 270 are the same as those of the former exemplary embodiment, so a detailed description thereof will be omitted.

[94] Meanwhile, in case in which the ice maker 200 is installed on the refrigerator door, since water filled in the ice making container 220 may be shaken to be gushed out before being completely frozen when the refrigerator door is open and closed. Thus, in order to prevent water put in the ice making container 220, a cover 290 may be additionally provided at an upper side of the frame 280.

[95] The cover 280 may have a shape of a semicircular section concave in the opposite direction to that of the ice making container 220, and a water supply groove 291 may be formed to be long in a horizontal direction at the center of the upper end of the cover plate 290. The cover 290 may include an elastic part 292 to allow the cover 280 to elastically open when the ice making container 220 is rotated.

[96] An ice supplying method in a refrigerator according to the present exemplary embodiment is as illustrated in FIGS. 14 and 15. Since it is similar to that of the former exemplary embodiment, a detailed description thereof will be omitted.

[97] The ice maker according to the present exemplary embodiment is slightly different in the configuration from the ice maker of the former exemplary embodiment, so there may be a difference in the corresponding operation. For example, when ice releasing is requested by the user, the heater 270 is operated by the control unit 280, and when the heater is operated 270, heat is applied to the frame 260 and an outer surface of the ice in contact with the partition walls 230 coupled to the frame 260 starts to melt (S8).

[98] Next, the driving motor 252 is operated by the control unit 280 to rotate the ice making container 220, and in this case, the ice cubes in the unit spaces (C), which are not completely separated from the ice making container 220, are inclined to rotate along the ice making container 220. However, since the ice cubes in the unit spaces (C) are stopped by the stopper 240, being restrained from rotating along the ice making container 220, so when the ice making container 220 is further rotated, the ice cubes

placed in the ice making container 220 are separated to freefall so as to be discharged to the ice storage container 52 for keeping ice in storage or directly discharged to the dispenser 53 (S12). In this case, residual water is generated as the interface of the ice is melt, but the residual water moves in a state of being put in the ice making container 220 and remains in the water storage space 241 formed between the stopper 240 and the inner circumferential surface of the ice making container 220, thus preventing water from being introduced into the ice storage container 52. Accordingly, ice cubes stored in the ice storage container can be prevented from being entangled to degrade ice quality.

[99] Here, in the process of releasing ice from the ice making container 120 or in the process of preparing ice releasing, supply of cold air to the ice making chamber 51 may be stopped to facilitate the ice releasing operation and reduce power applied to the heater 133.

[100] When dispensing is completed, the operations of the heater 133 and the cutting unit 140 are stopped, the water supply valve 112 is open to supply an appropriate amount of water to the ice making container 120 by the water level sensor, the flow sensor, or the like. This sequential process is repeatedly performed.

[101] The operational effects of the ice maker, the refrigerator having the same, and the method for supplying ice of the refrigerator according to the present exemplary embodiment of the present invention are similar to those of the former exemplary embodiment of the present invention. However, in the present exemplary embodiment, since the ice releasing heater for releasing ice from the ice making container is installed on the partitioning plate as a fixed body, the ice making container can be easily driven, facilitating the fabrication and reducing power consumption.

[102] As the present invention may be embodied in several forms without departing from the spirit or essential characteristics thereof, it should also be understood that the above-described embodiments are not limited by any of the details of the foregoing description, unless otherwise specified, but rather should be construed broadly within its spirit and scope as defined in the appended claims, and therefore all changes and modifications that fall within the metes and bounds of the claims, or equivalence of such metes and bounds are therefore intended to be embraced by the appended claims.

Claims

[Claim 1] An ice maker comprising:
an ice making container having an ice making space to allow water to be put therein to make ice;
a partitioning plate having a plurality of partition walls to demarcate the ice making space into a plurality of unit spaces; and
a driving unit for supplying a rotary force to the ice making container to allow the ice making container to rotate with respect to the partitioning plate to release ice of the ice making space.

[Claim 2] The ice maker of claim 1, wherein the partitioning plate comprises a stopper for stopping ice of the ice making space to allow the ice to be released from the ice making container.

[Claim 3] The ice maker of claim 1, wherein the stopper is formed to connect the partition walls.

[Claim 4] The ice maker of claim 1, wherein a pusher is formed to be protruded from an opening end of the ice making container to push ice from the partitioning plate through the partition walls.

[Claim 5] The ice maker of claim 1, wherein the ice making container comprises an ice releasing heater.

[Claim 6] The ice maker of claim 5, wherein the ice releasing heater is electrically connected to the control unit, and the control unit comprises a detection unit for detecting the temperature of the ice making container or detecting a time which has lapsed since water was supplied, a determining unit for determining whether or not ice making has been completed by comparing the temperature or time detected by the detection unit with a reference value, and a command unit for controlling an ON/OFF operation of the heater according to the determination of the determining unit.

[Claim 7] The ice maker of claim 1, wherein the ice releasing heater is in contact with the partitioning plate.

[Claim 8] The ice maker of claim 7, wherein the ice releasing heater is electrically connected to the control unit, and the control unit comprises a detection unit for detecting the temperature of the ice making container or detecting a time which has lapsed since water was supplied, a determining unit for determining whether or not ice making has been completed by comparing the temperature or time detected by the detection unit with a reference value, and a command unit for con-

trolling an ON/OFF operation of the heater according to the determination of the determining unit.

[Claim 9] The ice maker of claim 2, wherein the ice making container is formed such that an opening end of the ice making container is higher than a contact end of the stopper corresponding to an inner circumferential surface of the ice making container, so that a water storage space is formed between the inner circumferential surface and an upper surface of the stopper.

[Claim 10] The ice maker of claim 2, wherein a cover is provided at an upper side of the stopper in order to prevent water put in the ice making container from overflowing.

[Claim 11] The ice maker of claim 10, wherein the cover comprises an elastic part enabling the cover to be elastically open when the ice making container is rotated.

[Claim 12] A refrigerator comprising:
a refrigerator main body having an ice making chamber; and
an ice maker provided in an ice making chamber of the refrigerator main body,
wherein the ice maker is configured according to any one of claim 1 to claim 11.

[Claim 13] The refrigerator of claim 12, wherein the refrigerator main body is demarcated into a freezing chamber and a refrigerating chamber, the ice making chamber is provided to a refrigerator door for opening and closing the refrigerating chamber, an ice storage container is provided to the refrigerator door having the ice making chamber in order to keep ice, separated from the ice maker, in storage, and the ice storage container is positioned within the range of the ice making container.

[Claim 14] The refrigerator of claim 13, wherein the ice storage container and the ice making container are disposed such that the center of the ice storage container and that of the ice making container are substantially consistent on a vertical line.

[Claim 15] A method for supplying ice, the method comprising:
making ice in an ice maker;
receiving an ice dispense signal from a user;
rotating an ice making container of the ice maker;
separating ice from the ice maker; and
dispensing the separated ice.

[Claim 16] The method of claim 15, wherein the ice making comprises:

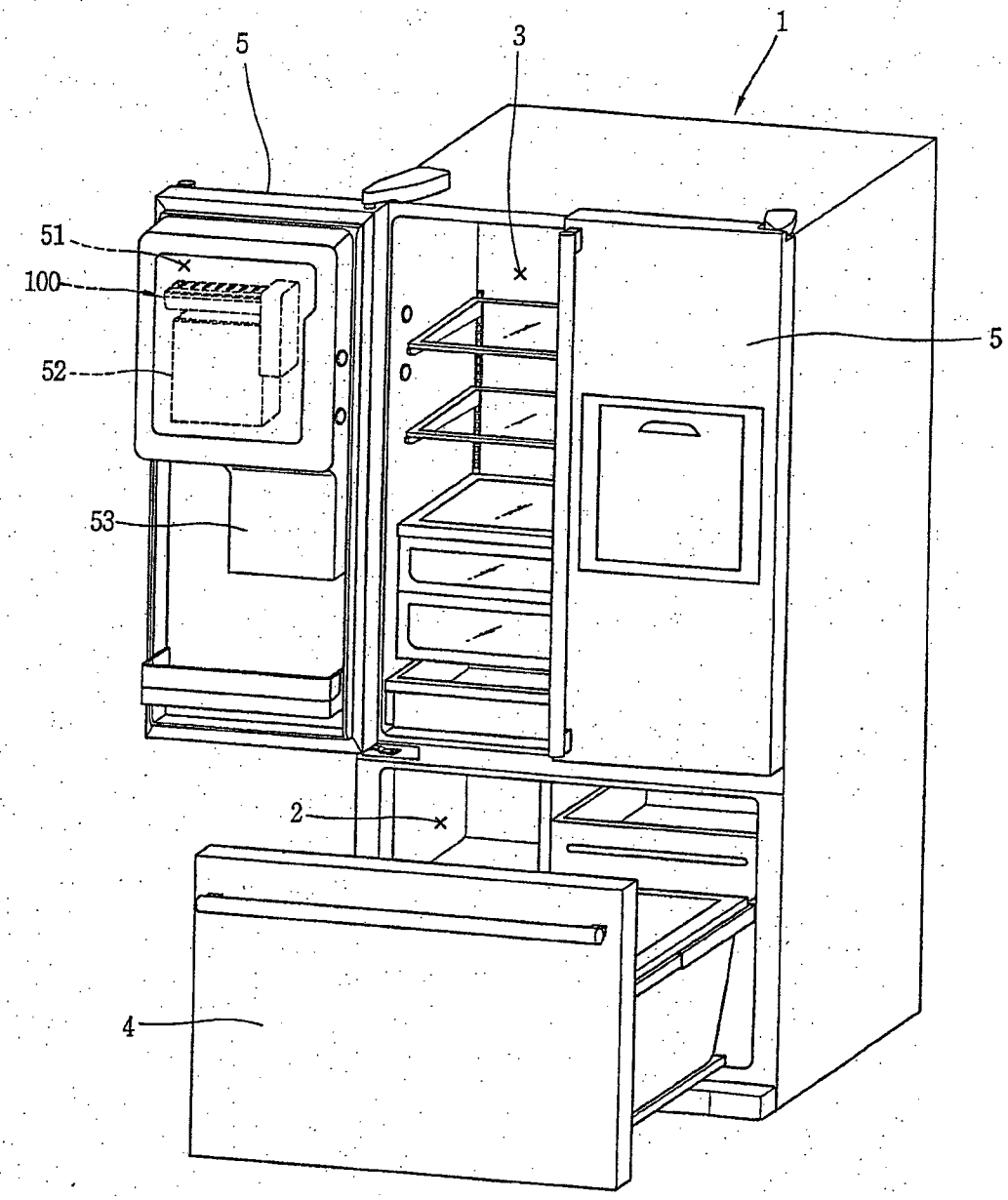
supplying water to the ice making container;
detecting the temperature or amount of water supplied to the ice making container; and
determining whether or not the detected water temperature and water amount has reached a pre-set water temperature or water amount.

[Claim 17] The method of claim 13, further comprising:
separating a contact surface between the ice making container and ice, before lifting the ice in the ice making container.

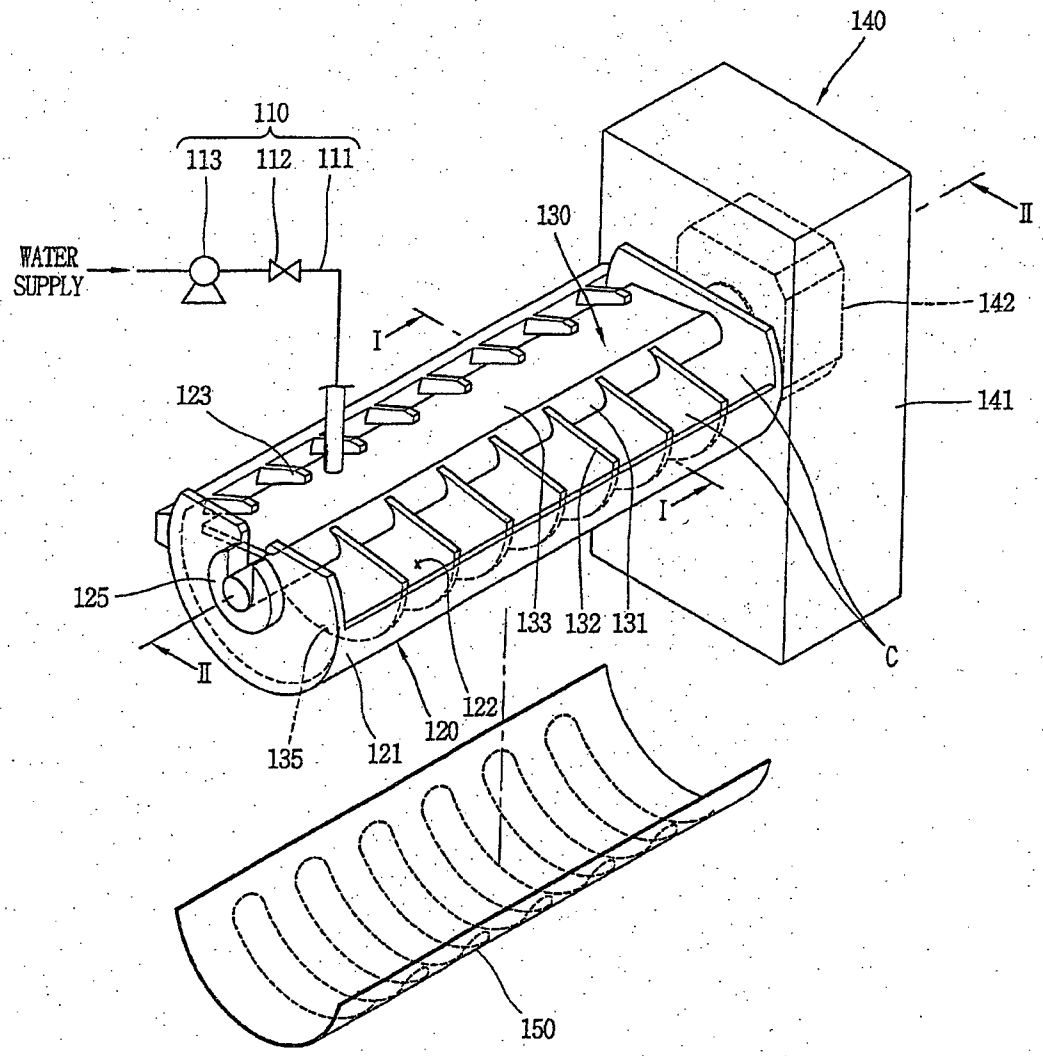
[Claim 18] The method of claim 15, wherein, in separating ice from the ice maker, the ice making container of the ice maker directly applies force to the ice while being rotated.

[Claim 19] The method of claim 15, further comprising:
stopping supplying of cold air to the ice making container before the ice making container is rotated.

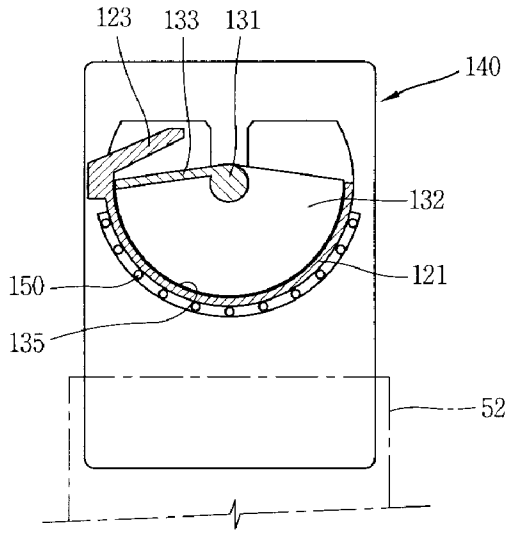
[Fig. 1]



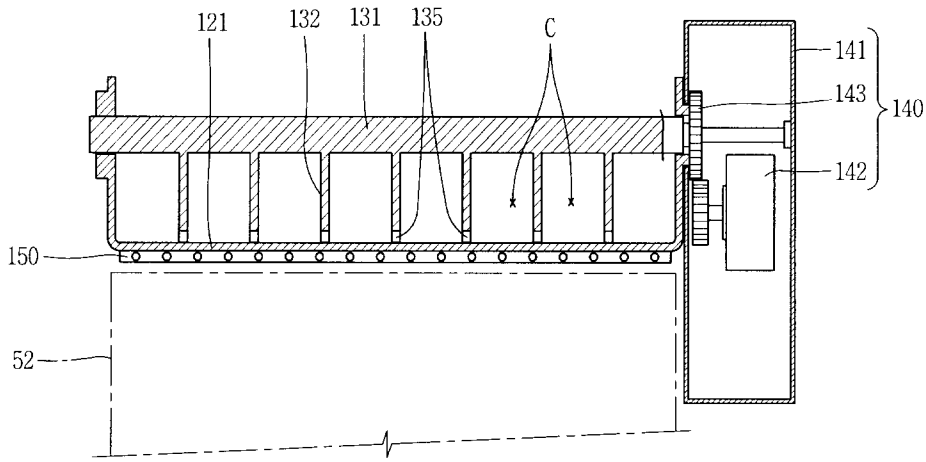
[Fig. 2]


140
110
113
112
111
WATER SUPPLY
130
II
142
I
123
141
I
125
133
132
131
C
II
135
121
120
122
150

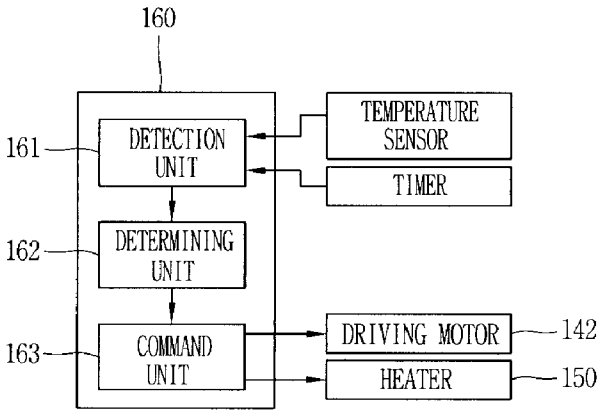
[Fig. 3]



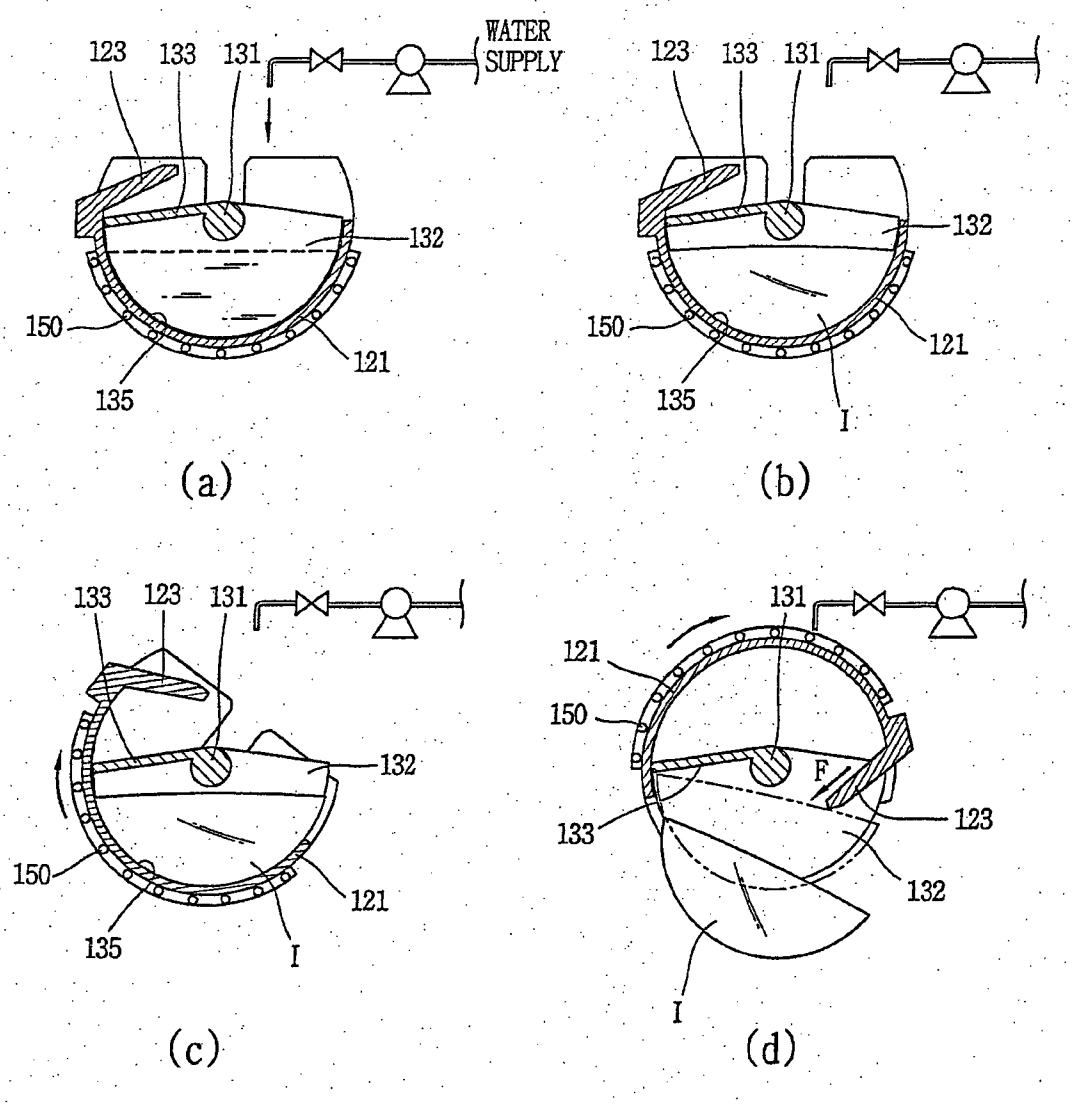
[Fig. 4]



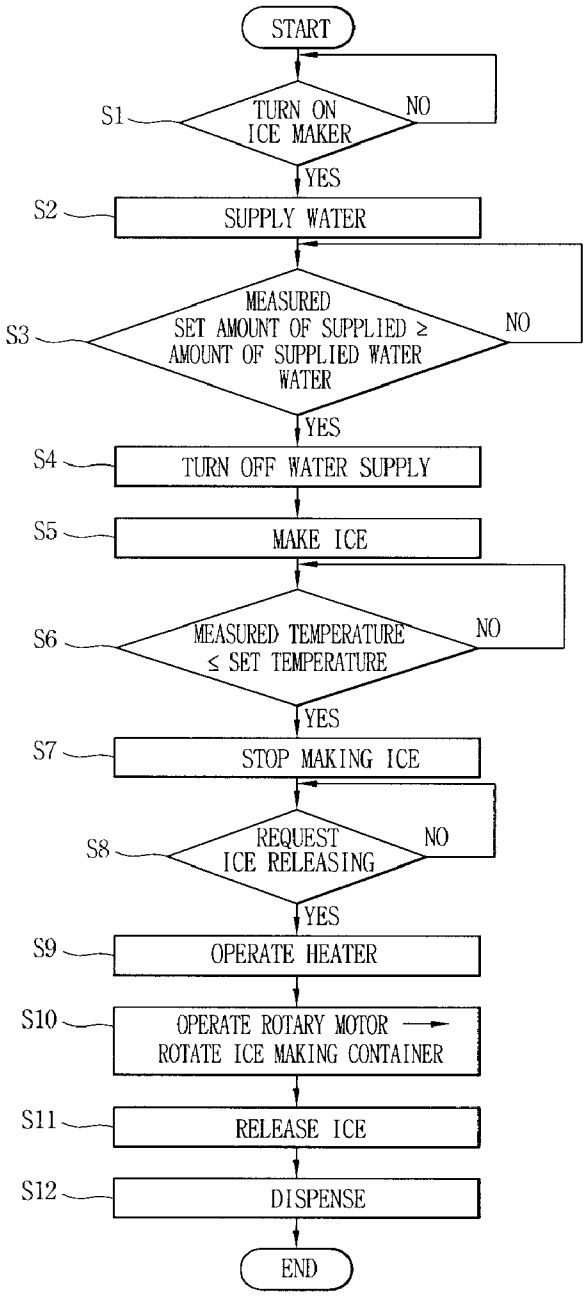
[Fig. 5]



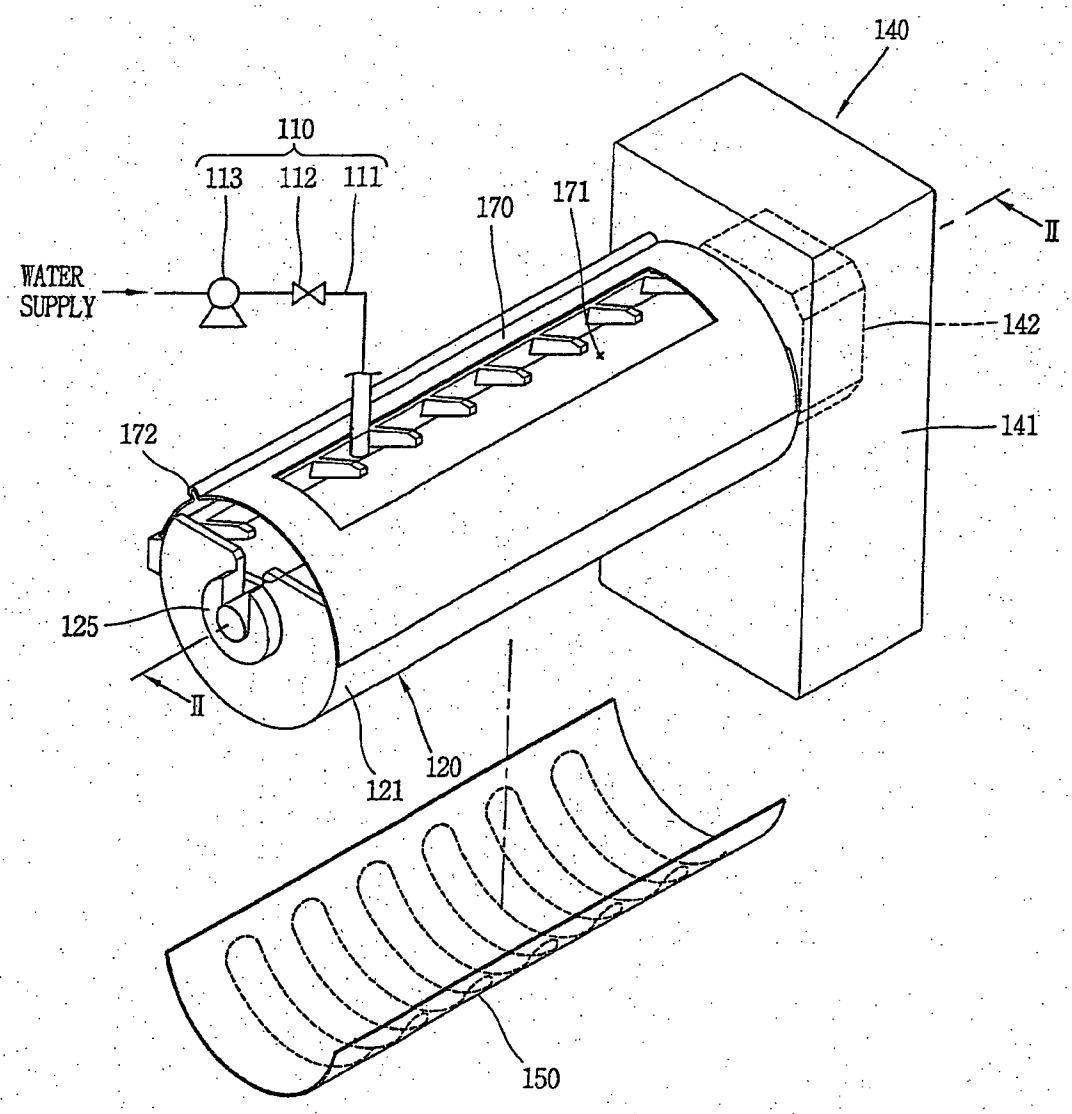
[Fig. 6]


123
133
131
WATER SUPPLY
132
150
121
135
(a)
123
133
131
132
150
121
135
I
(b)
133
123
131
132
150
121
135
I
(c)
131
121
150
F
123
133
132
I
(d)

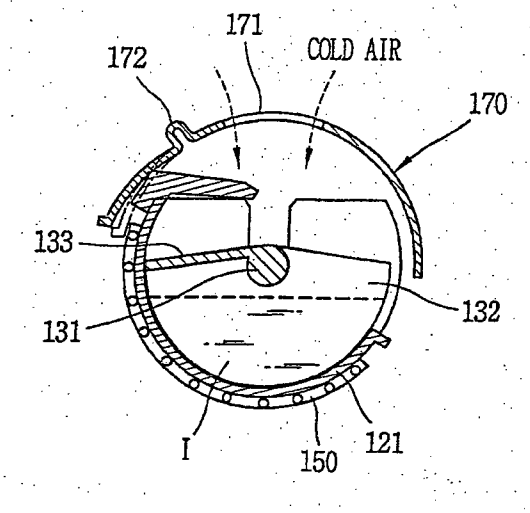
[Fig. 7]


START
S1
TURN ON ICE MAKER
NO
YES
S2
SUPPLY WATER
S3
MEASURED SET AMOUNT OF SUPPLIED ≥ AMOUNT OF SUPPLIED WATER WATER
NO
YES
S4
TURN OFF WATER SUPPLY
S5
MAKE ICE
S6
MEASURED TEMPERATURE ≤ SET TEMPERATURE
NO
YES
S7
STOP MAKING ICE
S8
REQUEST ICE RELEASING
NO
YES
S9
OPERATE HEATER
S10
OPERATE ROTARY MOTOR → ROTATE ICE MAKING CONTAINER
S11
RELEASE ICE
S12
DISPENSE
END

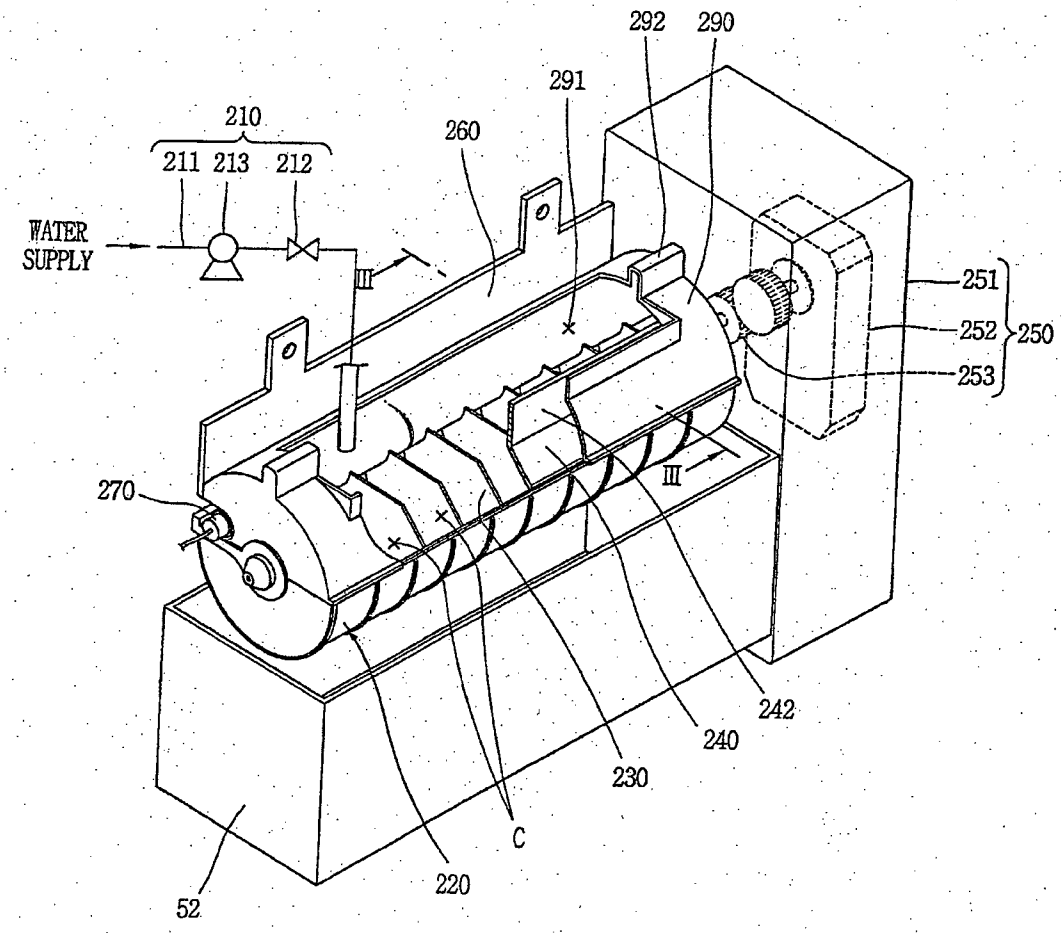
[Fig. 8]


140
110
113
112
111
170
171
II
WATER
SUPPLY
142
141
172
125
II
121
120
150

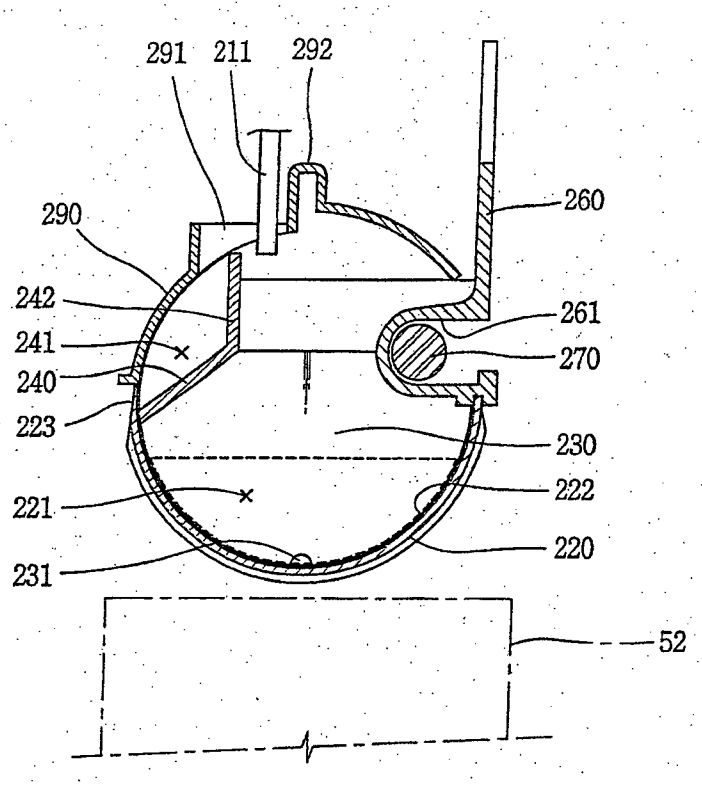
[Fig. 9]



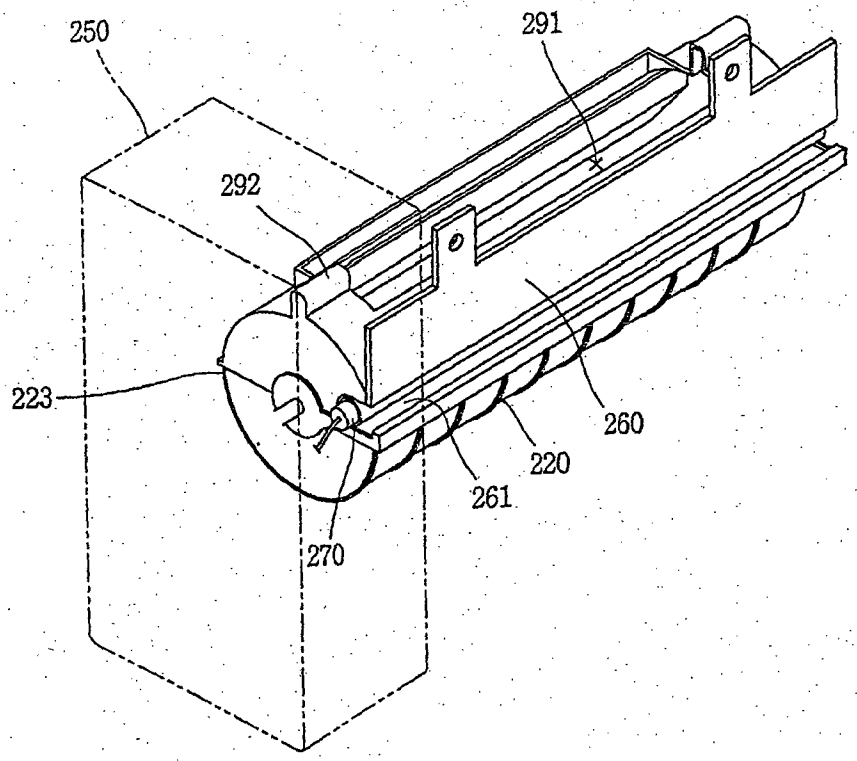
[Fig. 10]


292
290
291
210
211 213 212
260
WATER SUPPLY
III
251
252
250
253
270
III
242
240
230
C
220
52

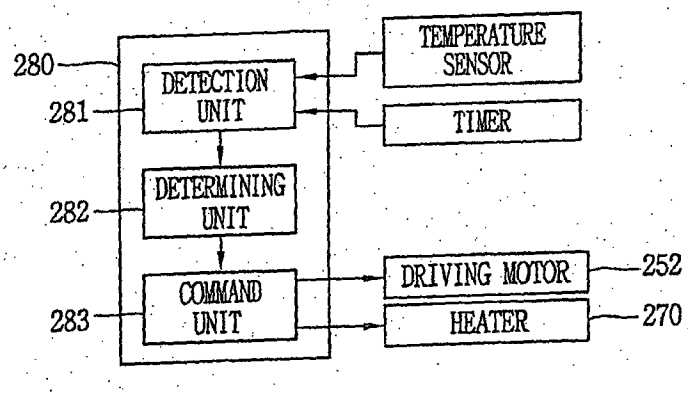
[Fig. 11]


291
211
292
290
260
242
261
241
270
240
223
230
221
222
220
231
52

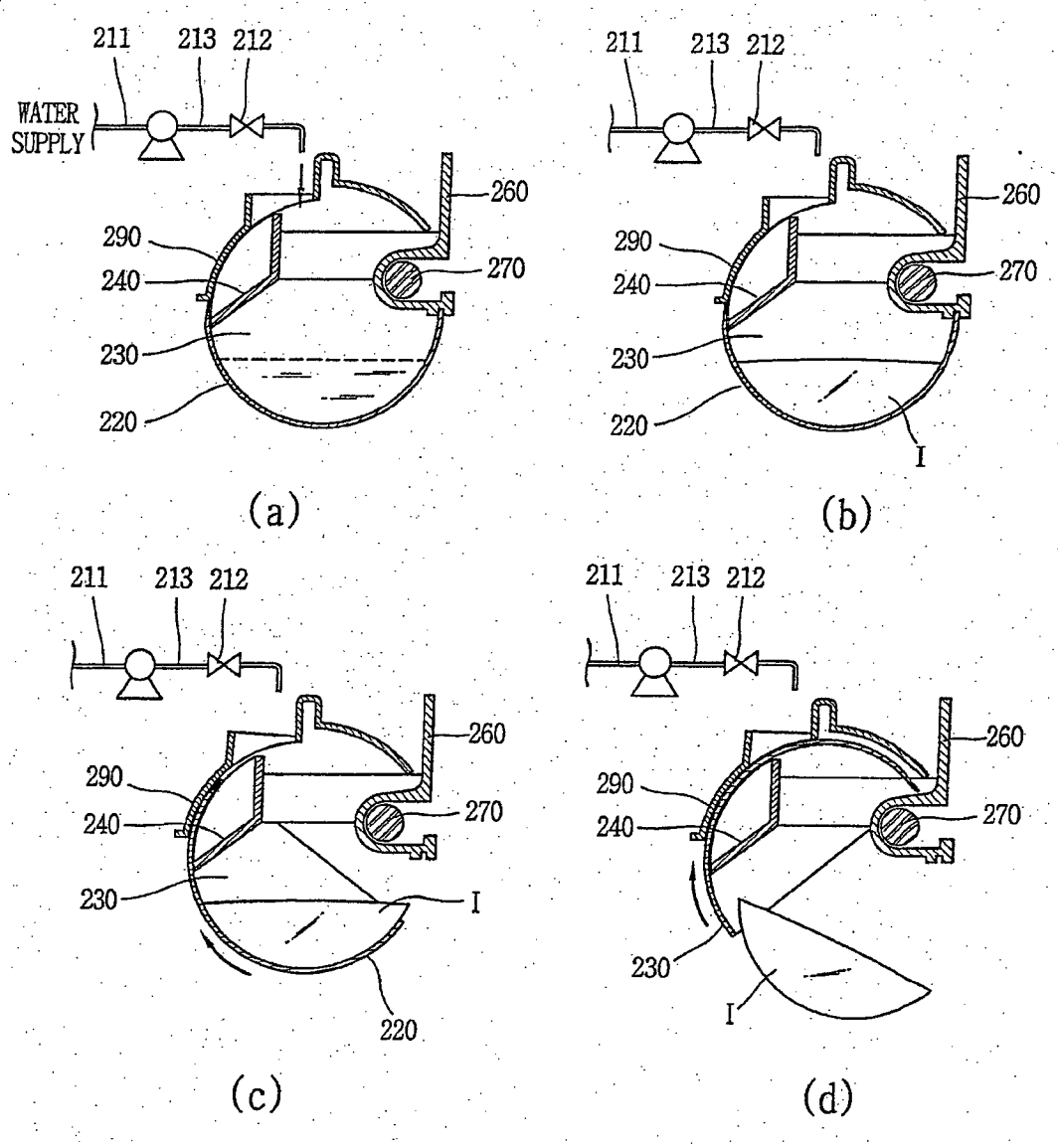
[Fig. 12]


250
291
292
223
260
220
261
270

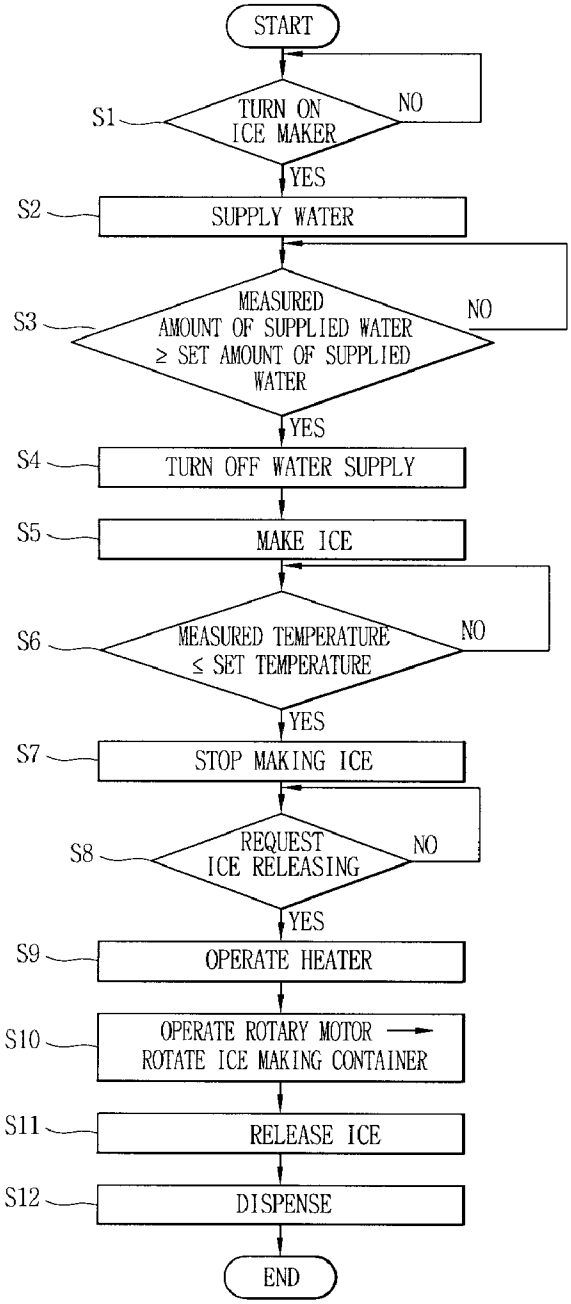
[Fig. 13]


280
281
282
283
DETECTION UNIT
DETERMINING UNIT
COMMAND UNIT
TEMPERATURE SENSOR
TIMER
DRIVING MOTOR
HEATER
252
270

[Fig. 14]



[Fig. 15]


START
S1
TURN ON ICE MAKER
NO
YES
S2
SUPPLY WATER
S3
MEASURED AMOUNT OF SUPPLIED WATER ≥ SET AMOUNT OF SUPPLIED WATER
NO
YES
S4
TURN OFF WATER SUPPLY
S5
MAKE ICE
S6
MEASURED TEMPERATURE ≤ SET TEMPERATURE
NO
YES
S7
STOP MAKING ICE
S8
REQUEST ICE RELEASING
NO
YES
S9
OPERATE HEATER
S10
OPERATE ROTARY MOTOR → ROTATE ICE MAKING CONTAINER
S11
RELEASE ICE
S12
DISPENSE
END